REMARKS

I. Status of the Claims

Claims 1-20 are pending in this application. Claims 19 and 20 are cancelled in this response. Claims 1-18 remain for consideration.

II. Response to the Section 102 Rejection

Applicants have cancelled claims 19 and 20 which Examiner rejected under 35 U.S.C. § 102(b) as being anticipated by Bowan et al. (WO 98/00413).

III. Response to the Section 103(a) Rejections

A. Rejection over Jones in view of Sato

Applicants traverse the rejection of claims 1-18 under 35 U.S.C. § 103(a) as unpatentable over Jones (U.S. Pat. No. 6,307,073) in view of Sato et al. (JP 4-352771), and they respectfully ask the Examiner to reconsider and withdraw the rejection in view of the following remarks.

"A proper analysis under § 103 requires, inter alia, consideration of two factors: (1) whether the prior art would have suggested to those of ordinary skill in the art that they should make the claimed composition or device, or carry out the claimed process; and (2) whether the prior art would also have revealed that in so making or carrying out, those of ordinary skill would have a reasonable expectation of success" (emphasis added). *In re Vaeck*, 947 F.2d 488 (Fed. Cir. 1991). The cited patents neither suggest Applicants' claimed invention, nor would give one of ordinary skill a reasonable expectation that the claimed process would be successful.

Jones describes an epoxidation process that comprises reacting an olefin, hydrogen and oxygen in an oxygenated solvent in the presence of a catalyst mixture comprising a titanium zeolite and a supported catalyst comprising gold and a support, wherein the support is an inorganic oxide containing titanium or zirconium. The support is taught to be a titania, zirconia, or titania-silica. Examiner correctly states that Jones teaches a direct epoxidation process using a mixed catalyst comprising a palladium-

free titanium zeolite and a supported gold catalyst (e.g., gold on titania). However, Jones does not teach a palladium-containing titanium zeolite.

Sato teaches an epoxidation process that comprises reacting an olefin, hydrogen, and oxygen in the presence of a Group VIII metal and a titanosilicate. The Group VIII metal can either be (1) supported on the titanosilicate [i.e., a "palladium-containing titanium zeolite"] or (2) supported on silica, alumina, or activated carbon and then mixed with titanosilicate (see page 4, para. 11). Sato therefore teaches that a palladium-containing titanium zeolite is capable of producing epoxide without the added presence of palladium-free titanium zeolite that is required by Applicants' currently claimed process (see Practical Examples 1-11). There is nothing in Sato that suggests the addition of a palladium-free titanium zeolite to the palladium-containing titanium zeolite. Sato also shows that a supported palladium catalyst (in particular, Pd/C) and a palladium-free titanium zeolite also are useful in the epoxidation of olefins (see Practical Ex. 13).

However, neither Jones nor Sato teach the epoxidation process of the current invention that comprises reacting an olefin, hydrogen and oxygen in the presence of a catalyst mixture comprising a palladium-containing titanium zeolite and a palladium-free titanium zeolite. There is nothing to suggest the presently claimed invention either. This is because the sum of the teachings in the cited prior art (and other known art) was that the epoxidation of olefins with hydrogen and oxygen can be accomplished by a catalyst that combines (1) a noble metal that reacts hydrogen and oxygen to form an oxidizing agent (such as hydrogen peroxide; see Jones at Col. 1, lines 41-44); and (2) a titanium zeolite that then converts the hydrogen peroxide oxidizing agent and olefin to form epoxide. For instance, the supported gold catalyst of Jones is known to be useful for producing hydrogen peroxide from the reaction of hydrogen and oxygen (see U.S. Pat. No. 6,468,496). The palladium-free titanium zeolite is known to be a useful catalyst for the epoxidation of olefins with hydrogen peroxide (see, e.g. U.S. Pat. No. 4,833,260). However, Sato teaches that a palladium-containing titanium zeolite catalyst is, in and of itself, already useful for producing olefins from the reaction of olefins with hydrogen and oxygen (see also, e.g., U.S. Pat. Nos. 6,008,388, and 6,281,369).

Thus, the prior art teaches that the epoxidation of olefins is accomplished by the reaction of the olefin with hydrogen and oxygen in a solvent in the presence of a palladium-containing titanium zeolite catalyst. Because a palladium-containing titanium zeolite catalyst is capable of epoxidizing olefins, by itself, there is no suggestion in the prior art that the addition of palladium-free titanium zeolite would be beneficial to the olefin epoxidation process taught in Sato, for instance. This is because the palladium-containing titanium zeolite catalyst has both components required for the epoxidation reaction: (1) the palladium component to convert hydrogen and oxygen to an oxidizing agent; and (2) the titanium zeolite to form epoxide from the reaction of olefin with the oxidizing agent. Because a palladium-containing titanium zeolite epoxidizes olefins in the presence of hydrogen and oxygen, there is no suggestion in either Jones or Sato to add palladium-free titanium zeolite to the Sato process or palladium-containing titanium zeolite in place of Au/TiO2 in the Jones process because it was known that a palladium-containing titanium zeolite, by itself, epoxidizes olefins with hydrogen and oxygen.

In sum, the prior art would not have suggested to those of ordinary skill in the art that they should carry out Applicants' claimed process. Since a palladium-containing titanium zeolite catalyst, alone, is capable of epoxidizing olefins with hydrogen and oxygen, there is no suggestion that additional palladium-free titanium zeolite catalyst would be useful to the prior art process. Additionally, the cited prior art would not have revealed a reasonable expectation of success that in so carrying out Applicants' claimed process one would produce higher palladium productivity and a potential economic savings as demonstrated in the current application.

B. Rejection over Grey in view of Bowan

Applicants traverse the rejection of claims 1-18 under 35 U.S.C. § 103(a) as unpatentable over Grey et al. (U.S. Pat. No. 6,498,259) in view of Bowan et al. (WO 98/00413), and they respectfully ask the Examiner to reconsider and withdraw the rejection in view of the following remarks.

Like the combination of Jones and Sato, a combination of Grey and Bowan does not suggest, nor give one a reasonable expectation of success for using, Applicant's claimed epoxidation process that comprises reacting an olefin, hydrogen and oxygen in the presence of a catalyst mixture comprising a palladium-containing titanium zeolite and a palladium-free titanium zeolite.

Like Jones, Grey describes an epoxidation process that comprises reacting an olefin, hydrogen and oxygen in a solvent in the presence of a catalyst mixture comprising a palladium-free titanium zeolite and a noble metal catalyst (preferably palladium or gold). The noble metal catalyst is typically supported on a support such as carbon, titania, zirconia, niobium oxides, silica, alumina, silica-alumina, tantalum oxides, molybdenum oxides, tungsten oxides, titania-silica, zirconia-silica, and niobia-silica. In Grey, as in Jones, the noble metal catalyst makes oxidizing agent and the titanium zeolite converts the oxidizing agent and olefin to epoxide. Without both, the epoxidation reaction does not occur.

Bowman teaches an epoxidation process by the reaction of olefin with hydrogen and oxygen in the presence of a catalyst that comprises gold on a titanosilicate. Thus, Bowman's catalyst, like the catalyst of Sato, contains both necessary components on the same catalyst (i.e., the noble metal supported on the titanium zeolite). The reaction is typically performed in the gas-phase. Although the catalyst is taught to be "essentially free" of palladium, which one would guess was necessary to avoid prior art which taught palladium on titanosilicate catalysts, the catalyst still contains a noble metal – i.e., gold.

As discussed above, Bowman teaches that gold on a titanosilicate is useful for epoxidation of olefins with hydrogen and oxygen. There is nothing in Bowman to suggest adding additional palladium-free titanium zeolite catalyst to the gold/titanosilicate of Bowman, let alone adding additional palladium-free titanium zeolite catalyst to a palladium-containing titanium zeolite catalyst to develop the currently claimed process.

The § 103 analysis thus fails under both factors described above. First, the combination of Grey and Bowman would not suggest to one of ordinary skill in the art

that they should make Applicants' claimed epoxidation process since both Grey and Bowman teach that catalysts that contain a noble metal and titanosilicate are useful epoxidation catalysts. Once a catalyst contains both necessary components, there is no need for additional palladium-free titanium zeolite. The § 103 analysis also fails the second factor described above. Grey and Bowman do not reveal to those of ordinary skill would have a reasonable expectation of success that in so carrying out Applicants' claimed process one would produce higher palladium productivity and a potential economic savings as demonstrated in the current application.

In sum, a combination of either Jones and Sato or Grey and Bowman does not suggest, nor give one a reasonable expectation of success for using, Applicant's claimed epoxidation process.

In view of the foregoing, Applicants respectfully ask the Examiner to reconsider and withdraw the rejections and pass the case to issue. Applicants invite the Examiner to telephone their attorney at (610) 359-3480 if he believes that a discussion of the application might be helpful.

Respectfully submitted,

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I hereby certify that this correspondence is being deposited with the United States Postal Service as first-class mail, with sufficient postage, in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on May 23, 2005.

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Name of person signing

Kevin M. Carroll
Signature